

Comptroller and
Corporate Affairs CanadaComptroller and
Corporate Affairs Canada

(11) (A) No. 1 160 214

(45) ISSUED 840110

(52) CLASS 255-89

(51) INT. CL. ³ E21B 10/60, 17/18(19) (CA) **CANADIAN PATENT** (12)

(54) SHANK ADAPTOR FOR ROCK-DRILLING MACHINES

(72) Gustafsson, Gösta C.,
Sweden(73) Granted to Fagersta AB
Sweden

(21) APPLICATION No. 362,899

(22) FILLED 801021

(30) PRIORITY DATE Sweden (79.09103-9) 791102

No. OF CLAIMS 5

Canada

REPRODUCED BY THE PATENT OFFICE OF CANADA
CSC/OPIC (11-89)*Corresponds to SE 432 460***BEST AVAILABLE COPY**

ABSTRACT

The invention is concerned with a shank adaptor for a rock-drilling machine provided with at least one side flushing hole which connects an axial flushing hole of the adaptor with the outside thereof and which, together with the axial flushing hole, serves as a passage for transporting flushing medium. The side flushing hole has an oblong cross-sectional shape with the longitudinal axis of the oblong parallel to the longitudinal axis of the shank. The shank adaptor of the invention enables stress concentration at the outer edge of the side flushing hole to be reduced while decreasing hole-edges sensitive to fractural impressions by half, which also results in a reduction in the probability of fatigue cracks caused thereat by the rotary bending forces on the adaptor.

1160214

The present invention relates to a shank adaptor for rock-drilling machines provided with at least one side flushing hole whose axis preferably lies in the same plane as the axis of the adaptor and which connects the axial flushing hole of the adaptor with the outside thereof, and which side flushing hole, together with the axial flushing hole, serves as a transport passage for flushing medium.

Hydraulically operated machines are now used to an ever increasing extent in connection with rock drills.

- 10 These machines develop large forces, causing the drill to be sunk to great depths, which requires efficient removal of the drill sludge, i.e. effective flushing of the drill. In order to effectively flush away the sludge from the drill, the flushing medium must be maintained at a very high pressure, said medium normally being water or air. In order to ensure an efficient seal at the location where the flushing medium is introduced into the shank adaptor, there is arranged around said adaptor a flushing head into which the flushing medium is introduced and from where said medium
- 20 passes into the axial flushing hole of the adaptor through two circular side flushing holes, which may be drilled at right angles to the axial direction of the adaptor or drilled at an oblique angle thereto. This type of flushing, with a special flushing head around the adaptor, is called separate flushing.

The disadvantage with these side flushing holes, however, is that they cause fractural impressions, since the



1160214

stresses are particularly high in the two regions of that edge of the side flushing hole which lie in a diametrical plane through the side flushing hole at right

- 2a -

©

1160214

angles to the axis of the adaptor. Consequently, fracture of the adaptor is often caused by fatigue cracks extending from the said two regions of the side flushing-hole edge. The main cause of such fatigue cracks is that, when in operation, the adaptor is subjected to rotary bending stresses which are superimposed on the stresses originating from the shock waves.

In order to increase the wear strength and fatigue strength of the adaptor in its entirety, the adaptor is normally subjected to heat treatment, by carburizing the same. In this way, pressure stresses are obtained in the surface layer of the adaptor both axially and tangentially, which are intended to counteract the tensile stresses occurring in operation. It has been found, however, that this carburizing of the adaptor negatively affects the pattern of tension forces in side flushing holes of circular cross section. The tangential pressure forces namely add to the axial tension forces occurring in operation at the edge of the flushing hole whose diameter is at right angles to the axial direction of the adaptor. It is true that the axial pressure forces resulting from the carburizing of the adaptor initially counteract the negative effects of the tangential pressure forces, but because of the re-orientation of the stresses in the carburized surface zone as a result of the shock stresses occurring in operation, it has been found that the axial pressure stresses are rapidly reduced, and hence the aforementioned positive effect becomes negligible.

When the side flushing hole of circular cross section is drilled at an oblique angle to the adaptor, a certain

- 3 -

1160214

reduction in the stresses is obtained in the two aforementioned regions at the edge of the flushing hole lying in the diametrical plane through the flushing hole at right angles to the axis of the adaptor, owing to the fact that the contours of the edge of said side flushing hole obtain an elliptical shape. Since, however, the side flushing hole has a circular cross section, more than one hole is required, normally two, since the circular side flushing hole can not be given an excessively large diameter, although the cross sectional area of the flushing holes must still correspond substantially to the area of the axial flushing hole on the adaptor.

An object of the invention is to provide a shank adaptor provided with a single side flushing hole having a cross sectional shape such that stress concentration at the outer edge of the side flushing hole is reduced while decreasing hole-edges sensitive to fractural impressions by half, which also results in a reduction in the probability of fatigue cracks caused thereat by the rotary bending forces on the adaptor.

In accordance with the present invention, there is thus provided a shank adaptor for a rock-drilling machine, provided with at least one side flushing hole which connects an axial flushing hole of the adaptor with the outside thereof and which, together with the axial flushing hole, forms a transport passage for flushing medium. The

- 1/1

1160214

shank adaptor of the invention is characterized in that the side flushing hole has an oblong cross-sectional shape with the longitudinal axis of the oblong parallel to the longitudinal axis of the shank.

Preferably, the side flushing hole extends along an axis which lies in the same plane as the axis of the adaptor.

The ratio of length to width of the cross-section of the side flushing hole is preferably at least
10 3:1.

Because the cross-sectional area of the flushing hole in the adaptor according to the invention can be made greater, due to the fact that the hole has an oblong cross-sectional shape parallel with the axial direction of the adaptor, more than one single side flushing hole is no longer required, since the cross-sectional area of the hole can be made equal to the cross-sectional area of the

- 4 -

1160214

axial flushing hole of the adaptor. Because the side flushing hole now lies on only one side of the adaptor, the risk that the hole is located in the zone of the largest stresses, with respect to the rotary bending forces in operation, is greatly decreased.

The invention will now be described in more detail with reference to the accompanying drawings, in which Fig. 1 is a side view of one embodiment of a shank adaptor according to the invention, and Fig. 2 shows in section the flushing
10 hole in the adaptor of Fig. 1.

The illustrated adaptor has a hammer surface 1 for the hammer piston of the drill machine, splines 2 for rotating the adaptor during a drilling operation, and an external screw thread 3 on which a jointing sleeve can be screwed. Fig. 2 is a sectional view through a flushing head 4. The flushing head is not shown in Fig. 1. The flushing head encloses the side flushing hole 5 of the adaptor, said hole 5 opening out into the axial flushing hole 6. The head 4 is provided with an inlet connecting means 7 on which, for
20 example, a flushing-water hose can be connected. The head 4 is slidably mounted on the adaptor via sealing rings 8. The side flushing hole 5 extends at right angles to the axial flushing hole 6, the hole being made by means, for example, of a shank end miller, whereby the two ends 9 obtain the form of half cylinders while the sides 10 extend parallel to the direction of the adaptor axis, the length of the hole between the two ends 9 being approximately three times the width of

1160214

the hole.

Although the shank adaptor according to the invention has been described with reference to a particular embodiment thereof, it is not restricted thereto but can be modified

- 5a -

C

1160214

within the scope of the claims.

- 6 -

1160214

The embodiments of the invention, in which an exclusive property or privilege is claimed, are defined as follows:-

1. - A shank adaptor for a rock-drilling machine, provided with at least one side flushing hole which connects an axial flushing hole of the adaptor with the outside thereof and which, together with the axial flushing hole, forms a transport passage for flushing medium, characterized in that the side flushing hole has an oblong cross-sectional shape with the longitudinal axis of the oblong parallel to the longitudinal axis of the shank.

2. - An adaptor according to claim 1, characterized in that the side flushing hole extends at right angles to the axial flushing hole.

3. - An adaptor according to claims 1 or 2, characterized in that the side flushing hole extends along an axis which lies in the same plane as the axis of the adaptor.

4. - A shank adaptor for rock-drilling machines provided with passage means for allowing transport of flushing medium through the adaptor, said passage means comprising an axial flushing hole and a side passage which connects said axial flushing hole with a flushing medium supply means located outwardly of the adaptor, said side passage having an oblong cross-sectional shape with the longitudinal axis of the oblong parallel to the longitudinal axis of the shank, wherein the ratio of length to width of said cross-section is at least 3:1.

7

1160214

5. - An adaptor according to claim 4, wherein there is provided only one side passage.

11

8



1160214

Fig. 1

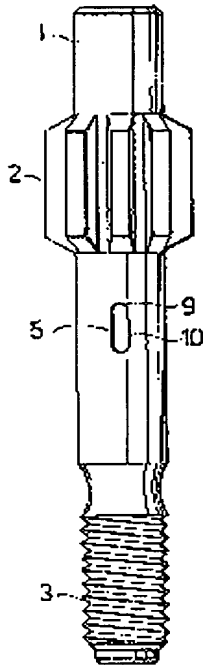
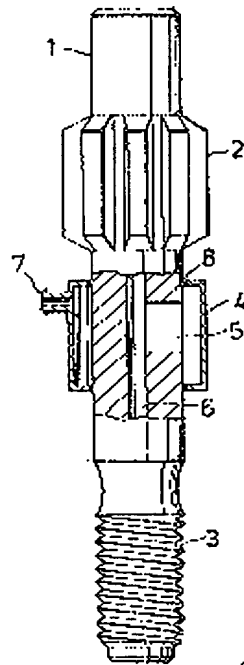


Fig. 2



*Swaley, Mitchell, Houle,
Mauroux & Shive*
Patent Agents

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☒ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☒ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.